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E. M. Rogozina, et al

Environmental Protection Agency
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(K voprosu ob opredelenii kisloroda i uglekislogo gaza v vozdukhe)

E. M. Rogozina and L. F. Dikaya

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ON THE QUESTION OF DETERMINING OXYGEN AND CARBON DIOXIDE IN THE AIR

E. M. Rogozina and L. F. Dikaya
Leningrad Scientific-Research Institute of Radiation Hygiene
RSFSR Ministry of Public Health

Gas chromatography is gradually displacing all other methods of analyzing the gas content of the air. For chromatographic determination, the selection of the sorbent-filler of the column is important. Thus, most often recommended to test carbon dioxide is silicagel, to test oxygen — 5A molecular sieves (P. A. Frolovskiy). For simultaneous analysis of oxygen and carbon dioxide, several authors suggest using parallel Zysyj and Newton columns. Our purpose was to develop simultaneous determination of oxygen and carbon dioxide in the air in a KhL-69 chromatograph without structural changes in the instrument itself. As a sorbent we used SKT brand activated charcoal in 0.25-0.5 mm granulation. Carrier gas was nitrogen, flow rate of the carrier gas was 4 l/hr. Temperature in the column unit was 150°, length of the carrier 4.8 m. Separated components are distinguished by a thermal conduction detector with a current of 85 ma.

The air sample was introduced into the feed control valve in a volume of 2 ml. Test air must first be dried as moisture changes the properties of the sorbent-filler and lowers the resolving power of the column. Analysis of moist, undried air understates the concentrations of tested components in the air. Air samples are dried for analysis in a 1.5-2 ml gas ball filter filled with fused calcium chloride in 2-6 mm granulation. With 90% relative humidity of the air, the gas filter was used at least 100 times to dry a 5 ml air sample before its residual water content was less than 0.3 mg/l.

Retention time for oxygen is 2.5 minutes, for carbon dioxide 8 minutes. In view of the fact that there is significantly more oxygen in the air than carbon dioxide, the first had to be determined in 4-m and 8-m ranges on the recorder scale and the second in 1-m and 2-m ranges.

For quantitative determination of oxygen and carbon dioxide the absolute calibration method has been accepted. The accuracy of determining the CO_2 content in a mixture is ±0.06, that of oxygen ±0.1.

The oxygen content was calculated by measuring the height of the peak of the chromatogram, the carbon dioxide content by measuring the area of the peak. For each range on the recorder scale, with a constant regime of the instrument, control measurements were made of oxygen and carbon dioxide in cali-

brated mixtures and a calibration graph constructed in coordinates: along the axis of abscissa — the height or area of the peak (in mm and mm, respectively), on the axis of ordinates — the concentration of the component (in vol. %). With the help of such a calibration graph,the concentration of a particular component can easily be found. The accuracy and reliability of analyses depend primarily on careful calibration. However, the sensitivity of the chromatograph, operating for a long period of time, can change even when constant conditions are maintained (temperature, flow rate of carrier-gas, etc.). Therefore, it is necessary periodically to check the calibration graph using calibrated mixtures in the 1st and 2nd points of the curve.

This method has been used to measure air samples with oxygen contents from 10 to 21% and carbon dioxide contents from 0.1 to 6%. The time of the complete analysis, including air sampling, does not exceed 10 minutes. This method makes possible accurate and operative analyses of the air in industrial plants.

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